

Three New Genera of Asaphid Trilobites from the Lower Ordovician of Utah

By

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With 2 figures in the text.

In 1953 three species of asaphid trilobites were described by HINTZE from the Lower Ordovician of Utah, two of them were provisionally referred by him to the genus *Asaphellus?*, and one to the genus *Isoteloides?*; but he pointed out that these species ought probably to be assigned to new genera. At that time, however, he considered it convenient to assign them provisionally to previously established genera, and to await the further clarification of asaphid genera from a study of their type species (cf. HINTZE 1953, p. 136).

In connection with the preparation of a section of the Treatise on Invertebrate Paleontology on the family *Asaphidae*, type species of a large number of asaphid genera were re-examined by one of us (V. J.). It soon appeared that the species *Asaphellus? venta* HINTZE, 1953, *A.? quadrata* HINTZE, 1953, and *Isoteloides genalticurvatus* HINTZE, 1953, were clearly distinct from all other, superficially similar, asaphid genera. Topotype material of the two former species were sent by HINTZE to Uppsala where the impression obtained from the illustrations and descriptions by HINTZE (1953) of these species was confirmed. As the species mentioned above are of a rather common occurrence in certain divisions of the Lower Ordovician of Utah, and are, moreover, of a certain phylogenetic interest, the present writers felt justified in erecting new genera.

Gen. *Aulacoparia* HINTZE & JAANUSSON n. gen.

TYPE SPECIES.—*Asaphellus? venta* HINTZE, 1953.

DERIVATION OF THE NAME.—Gr. *aulax* = furrow + *pareia* = cheek, referring to the notched internal margin of the cephalic doublure.

DIAGNOSIS.—Preglabellar field moderately long. Glabella slightly expanded

in front of the eyes, rather well-defined. An occipital furrow present at least in some species. Posterior border furrow present on the fixed cheeks. Facial suture in front of the glabella intramarginal («isoteliform»). Eyes of moderate size situated at about the transverse mid-line of the cranidium or slightly behind it. Postero-lateral corner of the free cheek extended into genal spine. Panderian organ on the free cheek developed as a relatively broad notch in the inner margin of the doublure near the genal spine.

Hypostoma oblong, with a more or less rounded posterior margin and strong lateral furrows.

Thorax unknown.

Pygidium rather long, rachis long, prominent. Pleural field almost smooth, with mere traces of ribs.

DISCUSSION.—The genus *Aulacoparia* as defined above includes two distinct groups of species, one typified by *A. venta* from the G-2 zone of the Pogonip limestone of western Utah, and the other by *A. quadrata* from the slightly earlier G-1 zone of the Pogonip limestone. The differences between these groups, especially in the relative width of the doublure, are of a magnitude usually considered in the asaphids to be of generic importance. On the other hand, there are many essential points of similarity between these groups as e.g. in the general shape of the glabella, the development of the panderian organ on the free cheeks, the relative size of the eyes, and the general shape of the hypostoma. For the time being, it is more advantageous from a general taxonomic point of view to stress the similarities and to regard both groups as separate subgenera of a single genus. When more species of both groups are known it may be found possible to treat these subgenera as independent genera.

As pointed out by HINTZE (1953, p. 134) the cranidium of certain European asaphids is very similar to that of *A. venta*. In fact, *Pseudoasaphus* has an almost identical cephalon except for the relatively larger and more posteriorly situated eyes. The development of the panderian organ is, however, different in this genus (cf. SIEGRIED 1936, pp. 15—17). In the latter respect *Asaphus* (*Asaphus*) resembles remarkably *Aulacoparia*, but the dorsal side of the cephalon differs in the absence of a preglabellar field and also of genal spines. HINTZE (1953, p. 134) pointed out that the species tentatively referred by him to *Asaphellus*? differ, however, from the most similar European asaphids by their unforked hypostoma. In the general shape of the hypostoma *Asaphellus* and related genera («*Megalaspis*», *Kayseraspis* etc.) display a certain similarity to *Aulacoparia*. Other features of this group of genera, *i.e.* the usual absence of any terraced lines on their dorsal surfaces, the general development of the pygidium with its almost constant narrow doublure, and the different development of the panderian organ are, however, so unlike those in *Aulacoparia* that a close relationship can scarcely exist.

By the courtesy of Dr. G. A. COOPER (U.S. National Museum, Washing-

ton) we were able to obtain excellent new photographs of type material of *Kobayashia taurus* WALCOTT, 1925, the type species of the genus *Kobayashia* HARRINGTON, 1938. This material is unfortunately rather fragmentary, and consists mainly of internal molds. It is, therefore, hardly possible at present to give an exact definition of the genus *Kobayashia*. The type material shows, however, that it has a triangular pygidium with a well-defined concave border. The cranium is even more poorly preserved but a distinctive feature is found in the glabellar tubercle which is situated considerably in front of the area corresponding to the occipital furrow; in *Aulacoparia* this tubercle always lies immediately in front of the occipital furrow. No information is available about the size or exact position of the eyes in *Kobayashia taurus*. As far as can be judged from the type material of *Kobayashia taurus* this species is probably allied to *Bellefontia*, *Symphysurina*, and related genera which also have the glabellar tubercle in a similar position.

The exact relationship of *Aulacoparia* is uncertain, though the general resemblance to *Asaphus* and allied European genera may indicate some relationship. The shape of the hypostoma in *Aulacoparia* is certainly more primitive than that in *Asaphus*, and, as both genera seem to be approximately contemporaneous, *Aulacoparia* may constitute a primitive branch of the general *Asaphus-Ptychopyge* stock.

Subgen. *Aulacoparia* (*Aulacoparia*)

SUBGENOTYPE.—*Asaphellus? venta* HINTZE, 1953.

DIAGNOSIS.—Free cheeks and the preglabellar field as well as the pleural and postrachial fields of the pygidium more or less evenly convex. Rachis of the pygidium long, postrachial field short. Pygidial doublure narrow, its inner margin concave, laterally more or less following the external margin of the pygidium.

DISCUSSION.—Apart from the type species, »*Xenostegium*» *taurus* (WALCOTT) sensu ROSS (1951, Pl. 27, fig. 6, 7, 11) is also apparently referable to this subgenus. As pointed out by HINTZE (1953, p. 135), the specimens identified as *Xenostegium taurus* WALCOTT by ROSS (1951) are not conspecific or even congeneric with the stratigraphically older type material of WALCOTT (1925).

With regard to the differences between *Aulacoparia* (*Aulacoparia*) and *A. (Aulacoparina)* the discussion of the latter subgenus may be referred to.

OCCURRENCE.—Type species from the mid-Canadian *Protopliomerops contracta* (G-2) zone in the Fillmore limestone, Pogonip group, western Utah; »*Xenostegium*» *taurus* of ROSS (1951) is from the G-1 zone, Garden City formation, north-eastern Utah.

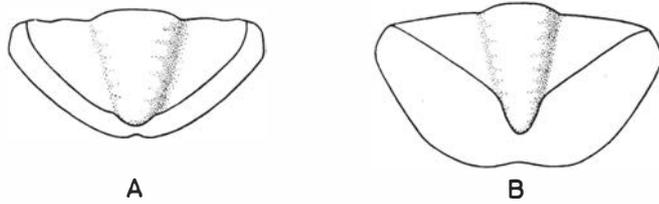


Fig. 1. A—*Aulacoparia (Aulacoparia) venta* (HINTZE). Ventral view of the pygidium to show the relative width of the doublure; reconstruction. B—*Aulacoparia (Aulacoparina) quadrata* (HINTZE). Ventral view of the pygidium to show the relative width of the doublure, after HINTZE 1953, Pl. XVI, fig. 5 b, slightly reconstructed; x 6.

Subgen. *Aulacoparia (Aulacoparina)* HINTZE & JAANUSSON n. subgen.

SUBGENOTYPE.—*Asaphellus? quadrata* HINTZE, 1953.

DIAGNOSIS.—Marginal area of the free cheeks and the preglabellar field more or less concave. Rachis of the pygidium and the postrachial field moderately long. Marginal area of the pleural field of the pygidium and the postrachial field more or less concave. Pygidial doublure broad, its inner margin on both sides of the rachis straight or feebly convex.

DISCUSSION.—In addition to the type species, the following forms described by ROSS (1951) probably belong also to this subgenus: *Asaphellus? eudocia* WALCOTT, 1925 and possibly *Asaphellus? sp. A*. Inasmuch as the development of the panderian organ and the pygidium are unknown in these species their generic status is somewhat uncertain.

The differences between the subgenera *Aulacoparia* and *Aulacoparina* are evident on comparing the respective diagnoses. *Aulacoparina* has a more or less distinct concave border of cephalon and pygidium whereas the marginal area of both cephalon and pygidium is more or less evenly convex in *Aulacoparia*. The most conspicuous difference lies, however, in the relative width of the pygidial doublure. This character, according to present knowledge of the Baltoscandian asaphids, shows a very limited degree of variation within a genus.

OCCURRENCE.—Type species from the mid-Canadian *Protopliomerops celsaora* (G-1) zone in the Fillmore limestone, Pogonip group, western Utah; *Asaphellus? eudocia* of ROSS (1951) is from the G-1 zone, Garden City formation, north-eastern Utah.

Gen. *Stenorhachis* HINTZE & JAANUSSON n. gen.

TYPE SPECIES.—*Isotelooides? genalticurvatus* HINTZE, 1953.

DERIVATION OF THE NAME.—Gr. *steno* = narrow + *rhachis*, referring to the narrow rachis in the type species.

DIAGNOSIS.—Preglabellar field about half the length of the glabella or slightly longer. Glabella narrow, rather well-defined, almost parallel-sided,

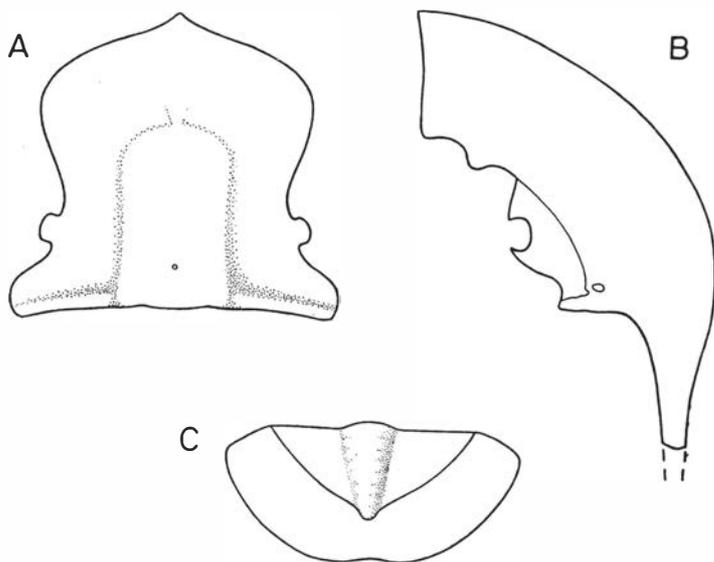


Fig. 2. *Stenorhachis genalticurvata* (HINTZE). A—Schematic dorsal view of the cranidium after HINTZE 1953, Pl. XVII, fig. 2 a, reconstructed; $\times 3$. B—Ventral view of the free cheek after HINTZE 1953, Pl. XVII, fig. 1 c; $\times 2.4$. C—Ventral view of the pygidium to show the relative width of the doublure, after HINTZE 1953, Pl. XVIII, fig. 2 a; $\times 3$.

or slightly decreasing in width anteriorly. No occipital furrow. A faint posterior border furrow present on the fixed cheeks. Free cheeks broad, marginal area slightly concave, postero-lateral corners extended into genal spines. Eyes small, situated far from the dorsal furrow, and comparatively near the posterior margin of the cephalon. Facial suture intramarginal («isoteliform»). Pandertian organ on the free cheeks developed as a rounded opening near the inner margin of the doublure.

Hypostoma and thorax unknown.

Pygidium rather broad, marginal area distinctly concave. Rachis narrow, well-defined. Pleural fields with mere traces of ribs. Doublure moderately broad, its inner margin slightly concave on both sides of the rachis.

DISCUSSION.—The type species is the only species of the genus known at present.

New photographs of the syntypes of *Isoteloides whitfieldi* RAYMOND (RAYMOND 1910, Pl. XIV, fig. 2, 3 and 4; WHITFIELD 1886, Pl. 34, fig. 1, 8) were taken by Dr. H. B. WHITTINGTON and generously placed at the present writers' disposal. These photographs have enabled us to get a much clearer concept of the genus *Isoteloides*. *Isoteloides whitfieldi* was erected by RAYMOND (1910, p. 36—37) for the species erroneously identified by WHITFIELD (1886) as *Asaphus canalis* HALL. From the formal point of view it was, however, an erection of new species, and all material identified by RAYMOND in his paper of 1910 as *I. whitfieldi* may be regarded as syntypes.

The specimens figured by WHITFIELD (1886) as *Asaphus canalis* are rather fragmentary, and none of them is suitable for a lectotype. We choose, therefore, here the specimen »Carnegie Museum 1433» (a nearly complete carapace) figured by RAYMOND 1910, Pl. XIV, fig. 2 to be the lectotype of *Isoteloides whitfieldi* RAYMOND, 1910. In reality this specimen has been the principal source of information regarding the characters of the type species of *Isoteloides*.

The type species of *Isoteloides* has a rather distinctly defined, moderately wide glabella, expanding slightly in front of the eyes (the reconstruction of RAYMOND 1910, Pl. XIV, fig. 1 is incorrect in this respect). A distinct, though comparatively shallow posterior border furrow is developed on the fixed cheeks. The other species subsequently referred to this genus, as e.g. *Isoteloides angusticaudus* RAYM., *I. homalotoides* (WALCOTT), *I. polaris* POULSEN, and *I. flexus* HINTZE, differ in certain respects from the type species: they have no posterior border furrow, or only a very slight trace of it, the preglabellar field is slightly shorter, the glabella less distinctly defined, and the lateral margin of the hypostoma not so evenly curved as in *I. whitfieldi*. In these respects they are, to some extent, intermediate between *Isoteloides* and *Isotelus*. A comparative study on the development of the panderian organ, unknown so far in *Isoteloides*, will probably throw more light on the evolutionary trends within the *Isoteloides-Isotelus* group.

Stenorhachis genalticurvata is clearly different from *Isoteloides* and the differences are so pronounced that although the hypostoma in this species is still unknown it is necessary to place this species in a new genus, *Stenorhachis*. This new genus differs from *Isoteloides* mainly in the following characters: (1). The preglabellar field is considerably longer; (2) the glabella is, comparatively, much narrower, and the fixed cheeks are broader; (3) the eyes are considerably smaller, and placed more laterally and more posteriorly; (4) the free cheeks are broader; (5) the rachis of the pygidium is comparatively narrower; (6) the doublure of the pygidium is distinctly broader. But in spite of these differences *S. genalticurvata* is probably rather closely allied to *Isoteloides*.

Ogygitoides KOBAYASHI, 1934, is even more similar to *Stenorhachis* than is *Isoteloides* especially with regard to its comparatively narrow glabella, rather wide fixed cheeks, and relatively long preglabellar field. The type species of *Ogygitoides*, *O. raymondi* KOBAYASHI, differs from *Stenorhachis genalticurvata* in the following main features: (1). The preglabellar field is shorter — about one third to one quarter of the length of the glabella; (2) the eyes are larger and situated at about the transverse mid-line of the cranidium; (3) there is no obvious posterior border furrow. In *Lachnostoma* ROSS, 1951 which also possesses a narrow glabella, relatively long preglabellar field, and small eyes, the glabella is broader anteriorly than in *Stenorhachis*, the eyes are situated closer to the glabella, and nearer the posterior margin of the

cephalon, and the pygidial doublure is narrower. *Lachnostoma* also possesses a characteristic groove on the ventral side of the free cheek, and no posterior border furrow.

OCCURRENCE.—Type species from the upper Canadian *Pseudocybele nasuta* (J) zone in the Wahwah limestone, Pogonip group, western Utah.

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